

AD-A192 691

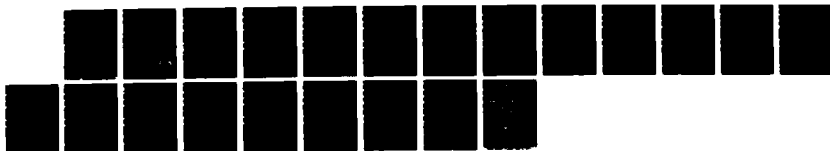
CONCEPTUAL DESCRIPTION OF A COMMERCIAL ACTIVITIES  
MANAGEMENT SYSTEM (CAMS)(U) CONSTRUCTION ENGINEERING  
RESEARCH LAB (ARMY) CHAMPAIGN IL R BLACKMON ET AL  
JAN 88 CERL-P-88/85

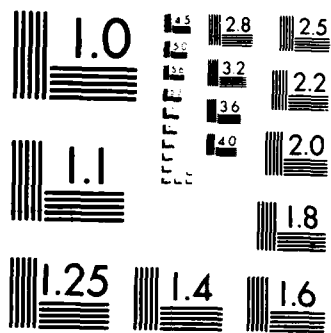
1/1

UNCLASSIFIED

F/G 5/1

NL







**US Army Corps  
of Engineers**

Construction Engineering  
Research Laboratory

**DTIC FILE COPY**

USA-CERL ADP REPORT P-88/05  
January 1988  
Automation of Quality Assurance  
Management Activities

2

**AD-A192 691**

# Conceptual Description of a Commercial Activities Management System (CAMS)

by  
Robert Blackmon  
James Johnson  
John Williamson

Quality assurance evaluators (QAEs) at Army installations currently spend hours of each working day arranging their inspection schedules and reporting their findings. This report outlines a concept for a Commercial Activities Management System (CAMS) which would automate much of the quality assurance (QA) planning process, allowing QAEs to spend their time inspecting instead of scheduling. In this concept, the CAMS program will have the capability to log and maintain records of work requests, maintain job-status records, sample designated job classes, schedule QA inspections, generate assignments for QAEs, record QA results, and generate contract discrepancy reports. The program could be implemented on existing IBM-compatible personal computer hardware and operated by personnel with the skills normally found in the Directorate of Engineering and Housing (DEH).

**DTIC  
ELECTE  
FEB 22 1988**  
**S D**  
CAH

Approved for public release; distribution is unlimited.

88 2 22 167

The contents of this report are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official indorsement or approval of the use of such commercial products. The findings of this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

***DESTROY THIS REPORT WHEN IT IS NO LONGER NEEDED  
DO NOT RETURN IT TO THE ORIGINATOR***

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				Form Approved OMB No 0704 0188 Exp Date Jun 30 1986	
1a REPORT SECURITY CLASSIFICATION Unclassified			1b RESTRICTIVE MARKINGS		
2a SECURITY CLASSIFICATION AUTHORITY			3 DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.		
2b DECLASSIFICATION / DOWNGRADING SCHEDULE					
4 PERFORMING ORGANIZATION REPORT NUMBER(S) USA-CERL ADP Report P-88/05			5 MONITORING ORGANIZATION REPORT NUMBER(S)		
6a NAME OF PERFORMING ORGANIZATION U.S. Army Construction Engr Research Laboratory		6b OFFICE SYMBOL (If applicable)	7a NAME OF MONITORING ORGANIZATION		
6c ADDRESS (City, State, and ZIP Code) P.O. Box 4005 Champaign, IL 61820-1305			7b ADDRESS (City, State, and ZIP Code)		
8a NAME OF FUNDING / SPONSORING ORGANIZATION OCE		8b OFFICE SYMBOL (If applicable) DAEN-ZCF-M	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c ADDRESS (City, State, and ZIP Code) 20 Massachusetts Ave. Washington DC 20314-1000			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO 4A62781	PROJECT NO AT41	TASK NO C
					WORK UNIT 062
11 TITLE (Include Security Classification) Conceptual Description of a Commercial Activities Management System (CAMS) (Unclassified)					
12 PERSONAL AUTHOR(S) Blackmon, Robert; Johnson, James; Williamson, John					
13a TYPE OF REPORT final		13b TIME COVERED FROM _____ TO _____		14 DATE OF REPORT (Year, Month, Day) 1988, January	
15 PAGE COUNT 19					
16 SUPPLEMENTARY NOTATION Copies are available from the National Technical Information Service Springfield VA 22161					
17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Commercial Activities Management System		
13	08		CAMS		
			Management Information System		
			quality assurance - IBM-PC		
19 ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>Quality assurance evaluators (QAEs) at Army installations currently spend hours of each working day arranging their inspection schedules and reporting their findings. This report outlines a concept for a Commercial Activities Management System (CAMS) which would automate much of the quality assurance (QA) planning process, allowing QAEs to spend their time inspecting instead of scheduling. In this concept, the CAMS program will have the capability to log and maintain records of work requests, maintain job-status records, sample designated job classes, schedule QA inspections, generate assignments for QAEs, record QA results, and generate contract discrepancy reports. The program could be implemented on existing IBM-compatible personal computer hardware and operated by personnel with the skills normally found in the Directorate of Engineering and Housing (DEH).</p>					
20 DISTRIBUTION AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED-UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21 ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a NAME OF RESPONSIBLE INDIVIDUAL Jane Andrew			22b TELEPHONE (Include Area Code) (217) 352-6511, x388		22c OFFICE SYMBOL CECER-IMT-E

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted  
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE

Unclassified

## FOREWORD

This work was done for the Office of the Chief of Engineers (OCE) under Project 4A62781AT41, "Military Facilities Engineering Technology"; Technical Area C, "Operations and Maintenance"; Work Unit 062, "Automation of Quality Assurance Management Activities." The OCE Technical Monitor is Mr. James Gibson, DAEN-ZCF-M.

It was performed by the Facility Systems (FS) Division of the U.S. Army Construction Engineering Research Laboratory (USA-CERL). The concept was proposed by Mr. John Williamson and developed by Mr. James Johnson. Mr. Robert Blackmon assisted with the development of the concept and supervised its progress. Mr. E. A. Lotz is Chief of USA-CERL-FS. The technical editor was Ms. Jane Andrew, Information Management Office.

COL Norman C. Hintz is the Commander and Director of USA-CERL, and Dr. L. R. Shaffer is the Technical Director.



Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

## CONTENTS

	Page
DD FORM 1473	1
FOREWORD	3
1 INTRODUCTION .....	5
Background	
Purpose	
Approach	
Mode of Technology Transfer	
2 THE ROLE OF A CAMS PROGRAM .....	7
3 OPERATING FEATURES .....	11
Interface Menus	
Functional Services	
Other Services	
Hardware and Software Requirements	
4 CONCLUSIONS AND PLANNING .....	16
Conclusions	
Schedule	
APPENDIX: References for the Commercial Activities Quality Assurance Process	17
LIST OF ACRONYMS	18
DISTRIBUTION	

# CONCEPTUAL DESCRIPTION OF A COMMERCIAL ACTIVITIES MANAGEMENT SYSTEM (CAMS)

## 1 INTRODUCTION

### Background

Under the Commercial Activities (CA) Program (outlined in Army Regulation [AR] 5-20<sup>1</sup>), an extensive conversion to contracting real property maintenance activities (RPMA) at Army installations has occurred, with an associated emphasis on quality assurance (QA) procedures to verify the contracted activities. Current QA staffs have an inadequate number of people to deal effectively and efficiently with the increased volume of contracts and inspections. The complexity of this activity is indicated by the regulations and other documents listed in the Appendix. Field observations by the authors indicate that with current staffing limits, an automated approach to the sampling, scheduling, and documentation of QA inspections in a CA context will be more convenient, productive, and cost-effective than manual procedures. Furthermore, such an automated system could be accommodated within the framework of existing procedures and microcomputer equipment.

### Purpose

This report proposes a concept for an automated system for supporting the QA activities required by a CA Program. This system is intended for use by the QA managers and evaluators in the the Directorate of Engineering and Housing (DEH) and by the assigned contracting officer's representative (COR).

### Approach

The CAMS program as described (in concept) in this report would provide automated support for the activities of the QAE. It would support the following activities:

- Processing of lists of maintenance and repair (M&R) jobs, and the sampling of these jobs for the inspection and statistical enforcement of contract performance
- Dynamic scheduling and assignments of QAE inspections to meet QA requirements
- Inspection reporting through the processing of QAE inspection records
- Collecting, organizing and presenting this inspection data for the COR's review
- Generating official-record contract discrepancy reports (CDRs) for the contracting officer.

---

<sup>1</sup>Army Regulation (AR) 5-20, *Commercial Activities Program* (Department of the Army, 21 October 1986).



Chapter 2 considers the overall role of CAMS and how it fits into QA operating structures and procedures, Chapter 3 details the proposed menu interfaces and the input/output features of CAMS, and Chapter 4 summarizes the concept and provides a schedule for coding and verifying CAMS.

### **Mode of Technology Transfer**

Technology transfer to system developers or field installation users will be accomplished by the U. S. Army Construction Engineering Research Laboratory (USA-CERL) through software and documentation, and by specialized instructions for any special or local conditions. CAMS will become part of the Integrated Facility System-Minicomputer (IFS-M), as part of Project Development Management (PDM) No. 8 for Contract Monitoring.

Two methods of technology transfer will be used. The first will use IFS-M documentation and training when the CAMS is integrated into IFS-M. The second method will provide CAMS software and documentation plus follow-on support when CAMS is used as a stand-alone. In any case, upon the release of CAMS to the field, its installation and maintenance will be supported by USA-CERL with appropriate instruction materials and by training sessions for requesting users.

## 2 THE ROLE OF A CAMS PROGRAM

The basic philosophy of the CA Program is that Army installations should provide for M&R services by the most cost effective method. This often results in contracting for M&R work rather than having it done by the DEH. However, the contracting approach requires close monitoring, usually with limited resources, to ensure that the work is of proper quality. Certainly, automating the QA functions will improve response times between M&R job completions and QA inspections. It is in this area that the CAMS program outlined in concept here can contribute to the effectiveness of contract administration.

Effective QA requires unbiased sampling for contract enforcement; timely scheduling so that inspections promptly follow job completions; efficient assignments of QAE daily inspections; orderly compilation of QAE findings; and recording, review, and reporting of results (especially where deficiencies occur). The general features of CAMS which will satisfy these needs are event flagging, job tracking, random sampling, multitiered scheduling, statistical interpretations, report generation, and historical record keeping.

Participation of CAMS in the QA management process is illustrated in Figures 1 and 2: Figure 1 shows the interaction between participants and Figure 2 shows functional performance. Figure 1 emphasizes the overall input/output relationships for CAMS. The top arc of the diagram identifies the contractor information interface; from this interface, contractor schedules with updates (or DEH estimates of this information) are fed from IFS into the CAMS data base; from this data base the bottom arc of QA control activities is then developed. In this plan, the iterative development of QA scheduling from the M&R planning results in inspection assignment cards which are supplied on a daily basis to the QAEs. After these inspections are made, the COR-evaluated results are supplied to CAMS, which automatically updates contractor failure records and which also will generate contract deficiency reports when requested.

Figure 2 shows some of the interactions of CAMS with important RPMA and QA functions. This diagram should be read in a clockwise direction, starting at the work reception center activity (1) at the top. (Item 0 is preliminary and takes place outside of CAMS.) The following is a walk-through of the processes shown in this figure.

0. QA management controls the automated scheduling process by means of two "preferential" listings entered before any CAMS processing takes place; these are a craft-category list and a QAE availability list which are held constant for the selected scheduling period.
1. The work reception center (either under DEH or contractor control) receives and evaluates service orders (SOs) and individual job orders (IJOs); this new job information is provided to CAMS after IFS-M validation.
2. The Contractor schedules the M&R, preventive maintenance (PM), and standing operations order (SOO) responsibilities and provides a list to the QA management.
3. CAMS initially produces QA sampling lists, then creates an integrated list, followed by a monthly inspection schedule for QAE planning. Times used in developing the schedule are based on average construction experience at that

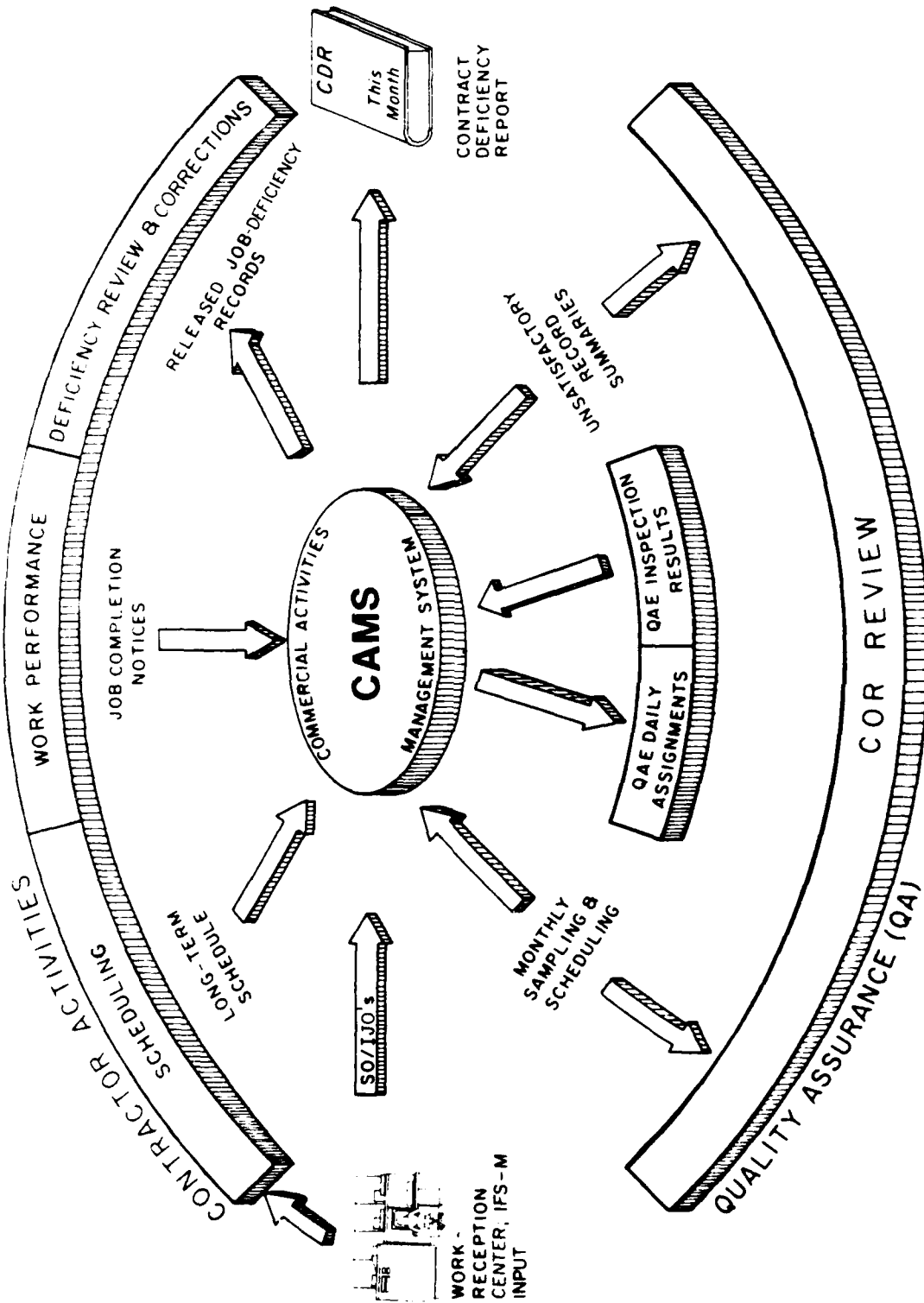


Figure 1. Overall input/output (I/O) relationships for the Commercial Activities Management System (CAMS).

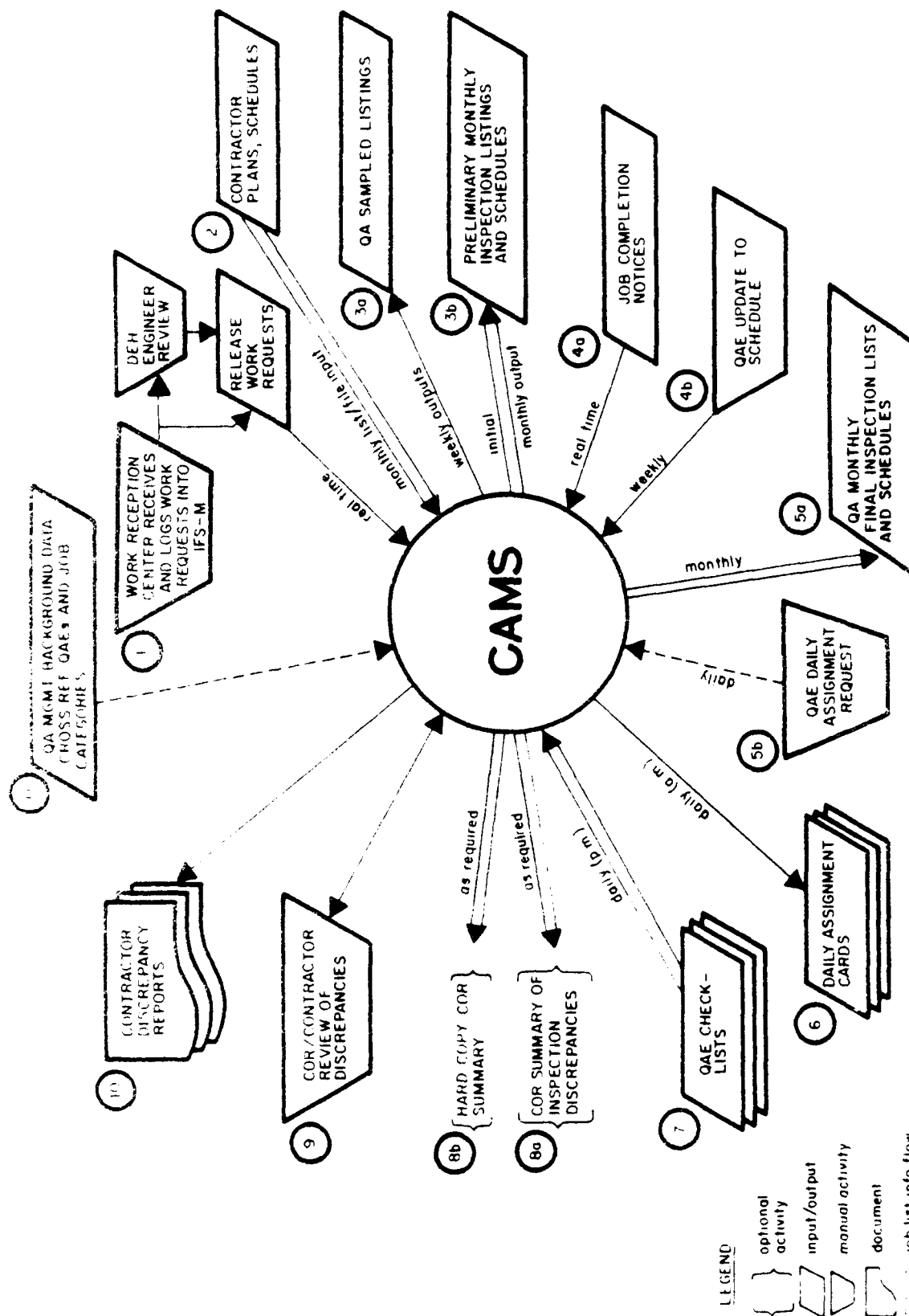


Figure 2. Interactions of CAMS.

control and function output flow

installation. QA management may review this tentative planning and allow it to stand, or may decide start over (item 0).

4. QA management enters firm completion dates from the contractor's schedule (or completion notices) and CAMS adjusts the QA scheduling accordingly.
5. QA planning lists and schedules are generated and studied.
6. Assignment cards are issued in the morning to each QAE to identify the inspection work for the day; every QAE is given inspection assignments for each day considering availability, applicability (specializations), urgency, and location. The QAE then picks up the checklists required for the assigned work and performs each inspection task in the order specified.
7. After job inspections are completed, all QAEs' checklists are recorded in the CAMS data base; if the assignment card was not completed, checklists will be missing and CAMS will reschedule the job(s) for a following day. Unsatisfactory reports are reviewed by the COR before these data are released from CAMS for general or contractor distribution.
8. QAE inspection-discrepancy record summaries may be generated on request for COR review.
9. COR/contractor coordination reviews are held to identify and verify discrepancies.
10. CDRs and special reports then will be generated by CAMS when requested by the COR.

### 3 OPERATING FEATURES

CAMS will be designed and developed to provide flexible support to QA management at U.S. Army installations. Users will be able to choose how extensively they make use of CAMS outputs. For example, the QA manager may use the computer generated job list but develop a schedule manually. The optional levels of CAMS use will be controlled by the DEH or by QA management.

#### Interface Menus

Figure 3 shows how a menu hierarchy guides the first time or occasional user; any consistently used capabilities may be accessed by the user directly. Selection menus (Figure 3) are a convenience which are provided for occasional access by the DEH management, the COR, and the in-house work receptionist. Interrogation menus, on the other hand, prompt the user for information which must be supplied to avoid a default response.

#### Functional Services

In this concept, IFS/CAMS provides the following services to support QA activities.

##### *Work-Reception Desk (optional)*

- Logging of work requests, automatically verifying that they have complete information and do not duplicate other work.
- Job-status tracking by each day or from a total active list; compilation of job completion statistics.
- Contractor planning and job data links to permit timely inspection scheduling.

##### *QA Management Services*

- Job sampling from default or user-controlled algorithms.
- Immediate, complete inspection scheduling; automated scheduling of personnel and equipment (by month or week).
- Individual QAE inspection scheduling; automated computations of assigned inspection times vs. available workday time (by week or day).
- Generation of daily assignment cards for each QAE at start of day (SOD); each entry dependent on the receipt of a job-completion notice from the contractor.
- Reading and recording of inspection checklist or bar-code records at the close of business (COB) of each day for each QAE.
- Generation of a summary of unsatisfactory checklist entries for COR/QAE review (daily).

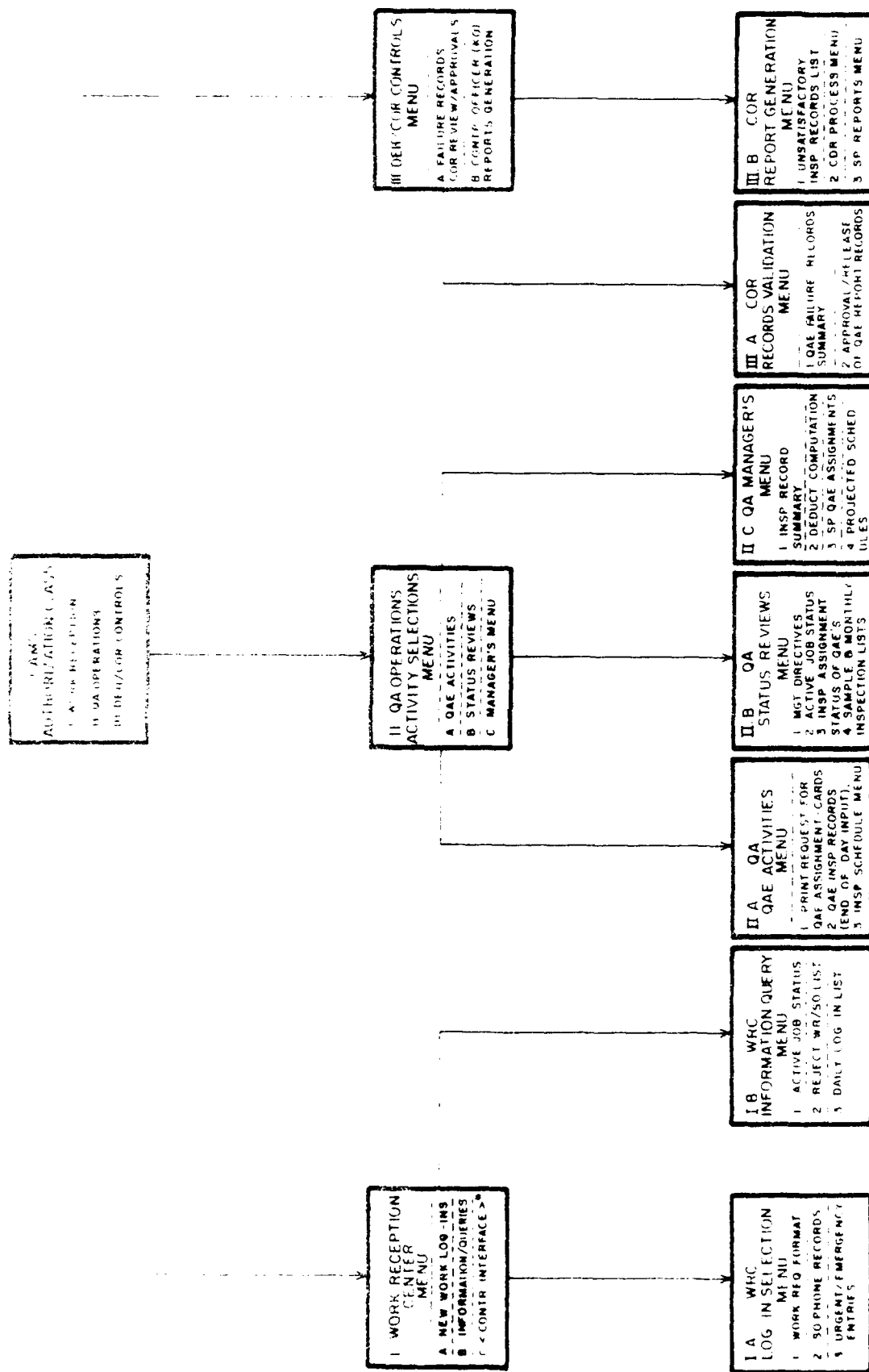


Figure 3. Selection menus hierarchy (example only).

### **COR Support**

- Display of records of unsatisfactory inspection results, for review/approval.
- Real time status updating and recordkeeping, including the contractor's rating and statistics on facility component/element failure rates.
- Complete QA reports generation; contract discrepancy reports generated for submittal to the contracting officer.

Figure 4 shows the proposed functional support of CAMS to DEH/COR/QAE activities. This is a sequential, functional-flow diagram in a situation where the DEH has the responsibility for work reception.

To start, as incoming SOs or work requests are received at the DEH work reception desk, CAMS generates a work order list of the verified work requests. From this, the RPMA contractor prepares an update to his existing (long-term) M&R schedule of cyclic (PM/SOO) jobs and any uncompleted SO/IJOs. The COR submits the updated contractor schedule to CAMS. A list of active SO/IJOs to be completed during the coming week is also maintained by CAMS. All IJOs and a sampling of the SOs to be completed during the week are reviewed for QA testing by the COR, who then submits this listing to CAMS for developing QA and QAE schedules. A direct product of the daily inspections listings in the weekly schedules (generated for individual QAE's) is the daily assignment cards which are developed for each facility component group or contract line item number (CLIN), and are provided at the start of the day to each QAE. These cards with their inspection results for the day are used for QAE COB reporting. These inspection results will be processed by CAMS into outputs suitable for review by QAE/COR. When such records are approved by the COR, they will be entered into the CAMS data base for record keeping and failure report generation.

### **Other Services**

A CAMS data base will be a source of RPMA/QA reference and job status information, which can be made available to authorized terminals and requesters. Some outputs potentially available from CAMS are shown in Table 1. For such outputs to be useful, inputs must be current and accurate. With CAMS fully integrated into COR/QAE operations, this should be the case.

### **Hardware and Software Requirements**

The functional and data base requirements for CAMS are well within the existing DEH capabilities. Hardware support may be met by the IBM PC AT (or compatible) and a dot matrix printer. No data base support procedures will be required which are significantly different from current commercially available systems (such as dBase III).



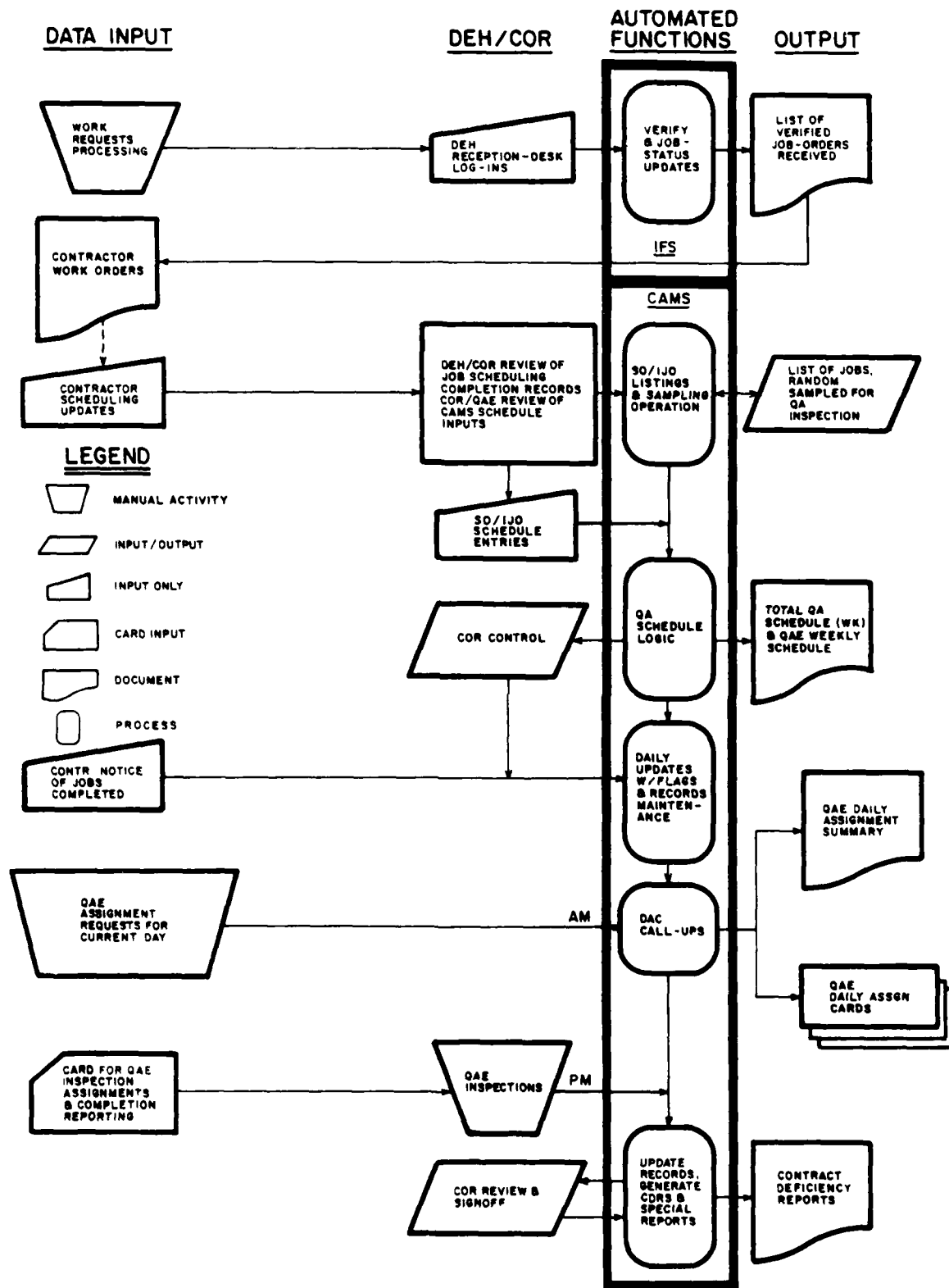


Figure 4. Functional services of CAMS in support of DEH/COR activities.

**Table 1**  
**CAMS Interactive Outputs**  
**(Possible Extensions to Basic System)**

<b>Type of Add-On Outputs</b>	<b>Output Information Provided</b>	<b>I/O Controller</b>	<b>Input Data Types</b>
<b>QAE INSPECTION STATUS</b> (restricted) by component-type	Scheduled inspections - dates - man/equipment hours	<b>COR/QAE</b>	<b>QA schedule dates for sam- pled SO jobs</b>
<b>CONTRACTOR JOB STATUS</b>	Job completion date; scheduled date or hold status; QA inspection and acceptance dates	<b>Contractor</b>	<b>Schedule dates on SO/IJO/ special jobs</b>
<b>WORKLOAD STATUS</b> by date of performance	Component/element job-types - number of jobs - man-hours - equipment hours - material quantities	<b>Contractor</b>	<b>Schedule dates for SO/IJO/ special jobs</b>
<b>RPMA- Contracting cost estimates</b> by job/facility- component	Job/materials - dollar level - man/equipment hours - quantities	<b>Contractor</b>	<b>Schedule costs for IJO/SOO jobs</b>
<b>STATISTICAL SUMMARIES</b> by fac-component/ fac-element/ facility ID	Failure & repair current statistics (for the data base)	<b>COR</b>	<b>Contractor performance records</b>
<b>ELECTRONIC BULLETIN BOARD</b> by job/date or sender	Facility/job flags - caution/notices MFR's, etc.	<b>DEH/COR/QAE</b>	<b>Electronic Mail</b>

## 4 CONCLUSIONS AND PLANNING

### Conclusions

The Commercial Activities Management System (CAMS), as proposed, will be effective and easily implemented. It will meet the scheduling, procedural and reporting needs of the quality assurance evaluators (QAEs), and strengthen the management activities of the contracting officer's representative (COR). The existing microcomputer hardware at most installations will support CAMS, which can be installed with minimum disruption to ongoing work. Further, CAMS is geared for the skill level of existing personnel.

The services provided by CAMS allow a controlled and efficient performance of QA operations. This support is flexible and can be used to whatever extent is preferred by the DEH. Sampling, for instance, can be applied to service orders or any other type of work order on demand; QA scheduling may be by the month, week, or day, or all three; the type and format of output reports also may be prescribed.

### Schedule

Coding, verification, and installation testing of a prototype CAMS and final product releases are scheduled in Table 2. General distribution of the released program is expected by June 1988.

**Table 2**

**Estimated Completion Schedule for  
CA Management System Program Development**

---

Concept development	16 February 87
Users Group Review (start date)	31 March 87
Functional Description developed; requirements defined	01 May 87
Coding and subroutine developments	1st Qtr. FY88
Installation of CAMS prototype at selected test site(s)	2nd Qtr. FY88
Deliverable CAMS development and release	3rd Qtr. FY88

---

## **APPENDIX:**

### **REFERENCES FOR THE COMMERCIAL ACTIVITIES QUALITY ASSURANCE PROCESS**

#### **Army documents:**

AR 5-20	Commercial Activities Program (DCSOPS)	10/86
AR 18-3	Automatic Data Management Information Systems	11/71
AR 18-7	Automatic Data Processing Management Review Program	11/84
AR 25-1	Army Information Management Program	3/86
AR-335-1	List of Recurring Management Information Requirements	3/86
AR-335-15	Management Information Control (TAGO)	12/82
AR 420 Series	Facility Engineering (USACE)	---
DA Pam 715-15	Service Contract Administration	3/86
MIL-STD-105D	Sampling Procedures and Tables for Inspection by Attributes	3/64
MIL-STD-500D	Military Standard for 3 of 9 Barcode	---

#### **Facilities Engineering Support Agency (OCE):**

FESA P-10	DEH Service Contract Guide	3/85
IFS VOL. III	FE Management System (FEMS) Module	(In revision)

#### **Office of Management & Budget:**

##### **OMB CIRCULAR NO. A-76**

Supplement 1:	Performance of Commercial Activities	---
---------------	--------------------------------------	-----

#### **USA-CERL Technical Reports (TR):**

TR P-85/04	Guide for Quality Assurance Inspection of Commercial Activities Contracts for Real Property Maintenance Activities	11/84
TR P-85/04 Supplement 1	Same	7/86

## **LIST OF ACRONYMS**

<b>AR</b>	<b>Army Regulation</b>
<b>CAMS</b>	<b>Commercial Activities Management System</b>
<b>CA</b>	<b>Commercial Activities</b>
<b>CDR</b>	<b>contract discrepancy report</b>
<b>CLIN</b>	<b>contract line item number</b>
<b>COB</b>	<b>close of business</b>
<b>COR</b>	<b>contracting officer's representative</b>
<b>DEH</b>	<b>Directorate of Engineering and Housing</b>
<b>IFS-M</b>	<b>Integrated Facility System-Mini(computer)</b>
<b>IJO</b>	<b>individual job order</b>
<b>MFR</b>	<b>memorandum for the record</b>
<b>M&amp;R</b>	<b>maintenance and repair</b>
<b>PM</b>	<b>preventive maintenance</b>
<b>QA</b>	<b>quality assurance</b>
<b>QAE</b>	<b>quality assurance evaluator</b>
<b>RPMA</b>	<b>real property maintenance activities</b>
<b>SO</b>	<b>service order</b>
<b>SOO</b>	<b>standing operation order</b>
<b>USA-CERL</b>	<b>U.S. Army Construction Engineering Research Laboratory</b>

# USA-CERL DISTRIBUTION

Chief of Engineers  
ATTN: DAEN-ZCF-M (6) (Tech Monitor)  
ATTN: CEIM-SL (2)  
ATTN: CECC-P  
ATTN: CECW  
ATTN: CECW-D  
ATTN: CECW-P  
ATTN: CEEC  
ATTN: CEEC-C  
ATTN: CEEC-E  
ATTN: CERD  
ATTN: CERD-C  
ATTN: CERD-M  
ATTN: CERM  
ATTN: DAEN-ZCE  
ATTN: DAEN-ZCI  
ATTN: DAEN-ZCM  
ATTN: DAEN-ZCZ

FESA, ATTN: Library 22060  
ATTN: CEFES-EC (10)  
ATTN: DET III 79906

US Army Engineer Districts  
ATTN: Library (41)

US Army Engineer District  
Sacramento 95814  
ATTN: SPKCO

US Army Engineer Divisions  
ATTN: Library (14)

US Army Europe  
AEAEN-ODCS/Engr 09403  
ISAE 09081  
V Corps  
ATTN: DEH (11)  
VII Corps  
ATTN: DEH (15)  
21st Support Command  
ATTN: DEH (12)  
USA Berlin  
ATTN: DEH (12)  
USASETAF  
ATTN: DEH (10)  
Allied Command Europe (ACE)  
ATTN: DEH (3)

8th USA, Korea (10)

ROE/US Combined Forces Command 96301  
ATTN: EUSA-BHC-CFC/Engr

USA Japan (USARJ)  
ATTN: AJEN-DEH 96343  
ATTN: DEH-Honshu 96343  
ATTN: DEH-Okinawa 96331

416th Engineer Command 60623  
ATTN: Facilities Engineer

US Military Academy 10946  
ATTN: Facilities Engineer  
ATTN: Dept of Geography &  
Computer Science  
ATTN: DSCPR/MAEN-A

ANMRC, ATTN: DRXMR-WE 02172

USA AMCCOM 61299-6000  
ATTN: AMSMC-RI  
ATTN: AMSMC-IS

AMC - Dir., Inst., & Serv  
ATTN: DEH (23)  
ATTN: AMCEN-A  
ATTN: SMCRI-CR  
ATTN: SMCRI-EH

DLA ATTN: DLA-WI 22314

DNA ATTN: WADS 20305

USAEA, CA (4)

Rock Island Arsenal 81021  
ATTN: SMCRI-CR  
ATTN: SMCRI-EH

U.S. Army Managt Engr Training Activity 61299  
ATTN: AMXOM-QA

Corpus Christi Army Depot 78410  
ATTN: SDBCC-EFA

FORSCOM  
FORSCOM Engr, ATTN: APEN-DEH  
ATTN: DEH (23)

HBC  
ATTN: HBCO-F 78334  
ATTN: Facilities Engineer  
Pittsboro AMC 80240  
Walter Reed AMC 20012

INSCOM - Ch. Instl. Div  
ATTN: Facilities Engineer (3)

MDW, ATTN: DEH (3)

MTMC  
ATTN: MTMC-SA 20315  
ATTN: Facilities Engineer (3)

NARADCOM, ATTN: DRDNA-F 01780

TARCOM, Fac. Div. 48090

TRADOC  
HQ, TRADOC, ATTN: ATEN-DEH  
ATTN: DEH (19)  
ATTN: ODCS/Engr (4)

TSARCOM, ATTN: STSAS-F 63120

USACC, ATTN: Facilities Engr (2)

WESTCOM  
ATTN: DEH, Ft. Shafter 96054  
ATTN: APEN-IM

SHAPE 09055  
ATTN: Surv. Section, CCB-OPS  
Infrastructure Branch, LANDA

HQ USEUCOM 09130  
ATTN: ECJ 47-LOE

FORT BELVOIR, VA 22060 (7)  
ATTN: Canadian Liaison Officer  
ATTN: British Liaison Officer  
ATTN: Australian Liaison Officer  
ATTN: French Liaison Officer  
ATTN: German Liaison Officer  
ATTN: Water Resources Support Ctr  
ATTN: Engr Studies Center  
ATTN: Engr Topographic Lab.  
ATTN: ATZA-DTE-SU  
ATTN: ATZA-DTE-EM  
ATTN: R&D Command

CEREL, ATTN: Library 03755

WES, ATTN: Library 30100

HQ, XVIII Airborne Corps  
and Fort Bragg  
ATTN: AFZA-FE-EE 26307

Area Engineer, AEDC-Area Office  
Arnold Air Force Station, TN 37389

Chanute AFB, IL 61968  
3345 CES/DE, Stop 27

Military Transport Management Command  
Military Ocean Terminal

Norton AFB, CA 92409  
ATTN: AFRCE-MX/DEE

AFESC, Tyndall AFB, FL 32403

NAVPAC  
ATTN: Engineering Command (7)  
ATTN: Division Offices (8)  
ATTN: Naval Public Works Center (9)  
ATTN: Naval Civil Engr Lab. (3)

NCEL  
ATTN: Library, Code L68A 93043

Defense Technical Info. Center 22314  
ATTN: DDA (3)

SETAF Engineer Design Office 09019

Engr Societies Library, NY 10017

Natl Guard Bureau Instl. Div 20310

US Govt Print Office 22304  
Receiving Set/Depository Copies (2)

US Army Env. Hygiene Agency  
ATTN: HSHB-E 21010

National Bureau of Standards 20099

END

DATE

FILMED

6-88

DTIC

